

### Claims

1. A catalyst for hydrocarbon steam cracking, which comprises  $\text{KMgPO}_4$  as a catalyst component.

5 2. The catalyst of claim 1, which is a supported catalyst in which  $\text{KMgPO}_4$  is supported on a carrier.

3. The catalyst of claim 2, wherein the carrier is selected from the group consisting of alpha-alumina, silica,  
10 silica-alumina, zirconium oxide, magnesium oxide, magnesium aluminate, calcium aluminate, and zeolite.

4. The catalyst of claim 2, wherein a content of  $\text{KMgPO}_4$  in the supported catalyst is in a range of 0.5-30 wt%, based  
15 on the total weight of the supported catalyst.

5. The catalyst of claim 2, wherein  $\text{KMgPO}_4$  is derived from a  $\text{KMgPO}_4$  precursor prepared from magnesium nitrate hydrate, potassium hydroxide, and ammonium phosphate.

20 6. A method for preparing a catalyst for hydrocarbon steam cracking, which comprises:

dissolving a  $\text{KMgPO}_4$  precursor in water to prepare an aqueous solution of the  $\text{KMgPO}_4$  precursor; and

25 impregnating a carrier with the aqueous solution of the

KMgPO<sub>4</sub> precursor to prepare a supported catalyst.

7. The method of claim 6, further comprising sintering the supported catalyst.

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8. The method of claim 7, wherein the sintering is carried out at 1,000-1,400°C for 22-26 hours.

9. The method of claim 6, wherein the KMgPO<sub>4</sub> precursor  
10 is prepared from magnesium nitrate hydrate, potassium hydroxide, and ammonium phosphate.

10. The method of claim 6, wherein the carrier is selected from the group consisting of alpha-alumina, silica,  
15 silica-alumina, zirconium oxide, magnesium oxide, magnesium aluminate, calcium aluminate, and zeolite.

11. The catalyst of claim 1, which is a sintered catalyst obtained by sintering a KMgPO<sub>4</sub> powder or a KMgPO<sub>4</sub> precursor powder  
20 and metal oxide.

12. The catalyst of claim 11, wherein a content of KMgPO<sub>4</sub> in the sintered catalyst is in a range of 0.5-50 wt%, based on the total weight of the sintered catalyst.

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13. The catalyst of claim 11, wherein the metal oxide is selected from the group consisting of alpha-alumina, silica, silica-alumina, zirconium oxide, magnesium oxide, magnesium aluminate, calcium aluminate, and zeolite.

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14. The catalyst of claim 11, wherein the  $\text{KMgPO}_4$  precursor is prepared from magnesium nitrate hydrate, potassium hydroxide, and ammonium phosphate.

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15. A method for preparing a catalyst for hydrocarbon steam cracking, which comprises:

mixing a  $\text{KMgPO}_4$  powder or a  $\text{KMgPO}_4$  precursor powder and metal oxide; and

sintering the resultant mixture to obtain a sintered catalyst of  $\text{KMgPO}_4$ -metal oxide.

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16. The method of claim 15, wherein the sintering is carried out at 1,000-1,400°C for 22-26 hours.

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17. The method of claim 15, wherein the metal oxide is selected from the group consisting of alpha-alumina, silica, silica-alumina, zirconium oxide, magnesium oxide, magnesium aluminate, calcium aluminate, and zeolite.

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18. A method for producing olefins by steam cracking of

hydrocarbons in the presence of the catalyst selected from the group consisting of a catalyst comprising  $\text{KMgSO}_4$  as a catalytic component, a supported catalyst and a sintered catalyst.

5        19. The method of claim 18, wherein the steam cracking is carried out at a reaction temperature of 600-1,000°C, a weight ratio of steam/hydrocarbons of 0.3-1.0, and LHSV (Liquid Hourly Space Velocity) of 1-20  $\text{hr}^{-1}$ .

10       20. The method of claim 18, wherein the steam cracking is carried out in a reactor selected from the group consisting of a fixed-bed reactor, a fluidized-bed reactor, and a mobile phase reactor.

15       21. The method of claim 18, wherein the catalyst is regenerated by removal of cokes formed on a surface of the catalyst at 500-1,300°C in the presence of air, steam, or a mixture thereof after the steam cracking.